

North Carolina  
Highway Bulletin

VOL. III

FEBRUARY, 1923

NO. 12



PROJECT NO. 695 UNION COUNTY—ASPHALTIC CONCRETE



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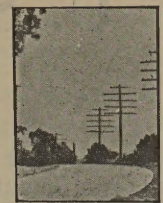
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# NORTH CAROLINA HIGHWAY BULLETIN



VOL. III, NO. 12

H. K. WITHERSPOON, Editor

FEBRUARY, 1923

## General Assembly Votes \$15,000,000 Additional Funds *for* Road Construction

**B**Y A VOTE of 85 to 9 in the House and of 39 to 2 in the Senate the General Assembly passed the road bill introduced by Representative Clayton Moore, of Martin County, which adds \$15,000,000 to the \$50,000,000 appropriated under the Doughton-Connor-Bowie Act by the 1921 Legislature, and which places a tax of 3c per gallon on gasoline.

Considering the importance of the bill and its far-reaching effects, the fact that it passed with very little legislative debate and by an overwhelming majority is indicative of the progressiveness of the people of North Carolina in desiring a State Highway System that will serve the traffic needs of the State and will aid in the development of the State as a whole. Besides it is a distinct compliment to the efficient manner in which the State Highway Commission has carried out the program that was inaugurated with the passage of the Doughton-Connor-Bowie Act of 1921.

Briefly, the bill provides an additional appropriation of \$15,000,000 and places a tax of 3c per gallon on gasoline and other motor vehicle fuels. It is estimated that the latter tax will bring in an annual revenue of approximately \$2,500,000 per year, making a total revenue, with the income from the registration of motor vehicles, of about \$5,500,000 per year. This tax places the burden of paying for North Carolina's roads in the proper place which is upon the motorist, the man who uses them. Income from this source is used to pay

the interest and sinking fund on the bonds issued for road construction and, after the operating expenses of the Automobile License Department of the Secretary of State's office are deducted the balance is turned over to the State Highway Commission for use in maintaining the State system of roads. It has been said that the

tax on gasoline would boost prices but, coincidence or otherwise, it is a fact that immediately after the passage of the 1921 law which placed a tax of one cent per gallon on gasoline there was a decline in price and at the present time motor fuels are considerably cheaper than when the tax was first placed on them. Granted, however, that the three cent tax does boost the price of "gas," which remains to be seen, the saving in the amount used, in the depreciation of the car itself, and in tires, all of which is brought about by the better maintenance of the highways will more

than offset an additional few cents in the initial cost per gallon of gasoline.

As is always the case there were certain members of the Assembly who were desirous of having certain amendments inserted in the bill, all of which, however, were voted down. The first of these was to have a special appropriation of \$1,000,000 set aside as a special fund to be applied in the First District on account of the fact that there were proportionately large bridges to build in this District by reason of its geographical

(Continued on page 19)

### *The Center Pole of Power*

**W**ITH machinery constructed fer carryin' heavy loads, it springs the proposition of securin' better roads. Where once we follered by-ways as we driv' the frisky shote, or poked along the highway that would stall a mountain goat—we now encounter road-hogs in their mighty souper-eight, or run acrost the flivver with its precious human freight.

In these strenuous days of "git-there" we have got to have the track, when half the people's goin' out, and half a-comin' back—when Granny and the children gets the taste fer higher speed, I reckon that a better road's the everlastin' need. So the Legislatur socks a bigger license on yer boat—while the tight-wad uses language that I wouldn't keer to quote.

Then resurrect yer shovel an' yer scraper, an' yer hoe—and don't be pessimistic when you're partin' with yer dough. Remember, we are livin' through a mighty restless hour, when rapid transportation is the center-pole of power! There's no excuse for terrapins, or lazy-minded toads, when Progress blows her whistle, in the call fer better roads.



# U. S. Bureau of Public Roads—History and Purpose

**T**HIS article is written for the information of those who are genuinely and seriously interested in the substantial improvement of the highways of their State. It is believed that a better understanding of the purposes of the Bureau and its relation to the highway activities of the State will produce more hearty co-operation from those who feel the need of better highway conditions. It should be borne in mind that the sole purpose of the Bureau is to aid in bringing about systematic improvement in the highways of the United States and to do this through the individual States.

The means of transportation employed in the days of George Washington were about the same as those in use centuries before his time, and even during the 19th century, in spite of the fact that great changes were wrought in the vehicles used, comparatively little progress was made in the methods of highway construction.

As early as 1806 Congress appropriated funds for a National Highway and some construction was accomplished, but when the railroad systems began to develop Federal participation in highway construction ceased and every effort was made to encourage and make possible the extension and success of the various railroads.

## State Aid

At the beginning of the 19th century, highway building in this country was practically an unknown science, in fact very little progress was made until the States assumed the burden. Practically speaking, State aid in highway construction began in 1891 when New Jersey passed a State Aid Law, and by 1917 every State had established a Highway Department. Very material advances have been made since that time—thanks to the insistent demand of motor vehicle transportation and to the close study of transportation requirements, road building materials and methods, but while the States were making progress in road-building the Federal Government was carrying on studies and investigations. In 1893 Congress established the Office of Road Inquiry for the purpose of investigating systems of road management and methods of road-making, and to give to the public the information so obtained.

These duties were gradually extended to include testing of the road materials and the conducting of experimental work. The Office of Road Inquiry became the Office of Public Roads, followed by the Office of Public Roads and Rural Engineering, and finally the Bureau of Public Roads. This Bureau is placed in the Department of Agriculture probably because agriculture is so vitally dependent upon adequate transportation.

Previous to 1916, with one marked exception, the activities of the office consisted largely of research work, testing of road materials, supervision of object lesson

and experimental roads, designing county road systems, the giving of advice in road finances, road construction and maintenance, to communities requesting same, and the collection and publication of road data.

The exception above referred to was made possible by the Post Office Appropriation Act of August 24, 1912, when \$500,000 was appropriated for improving, under the direction of the Secretary of Agriculture, such roads as might be jointly selected by the Postmaster General and the Secretary of Agriculture. After the roads were selected the Secretary of Agriculture placed them under the immediate supervision of the Office of Public Roads and Rural Engineering. This Act provided that in order to receive the Federal Aid the States should contribute two dollars for each one dollar contributed by the Federal Government. It was the first step made toward Federal Aid in highway construction in this country since the work begun in 1806 and later abandoned. Its immediate result was the construction of 17 roads in 13 States.

## The Present Highway Law

The real forward step in Government participation in highway construction was taken when on July 11, 1916, the President signed the bill known as the "Federal Aid Road Act," which appropriated \$75,000,000 in increasing amounts, beginning with five million dollars the first year, ten million the second, fifteen the third, twenty the fourth, and twenty-five the fifth, this amount to be used in co-operation with the States in the construction of post roads. This bill required that in order to avail itself of the provisions of the act a State must provide at least one-half the cost of the project, besides furnishing plans and engineering. It also provided that the plans, specifications, construction and maintenance should be satisfactory to the Secretary of Agriculture. The basis upon which the funds were apportioned among the States was as follows:

One-third in the ratio which the area of each State bears to the total area of the United States.

One-third in the ratio of population and one-third in the ratio of mileage of rural mail routes.

This is the basis of apportionment today.

The provisions of this law which practically restricted Federal Aid to those roads upon which mail routes were established prevented the laying out of a comprehensive or continuous system of highways and resulted in many projects being improved which had but little claim to receive Federal Aid except the fact that the mail carrier passed that way, though seldom more than once a day, and for the same reason many worthy projects were obliged to be passed up.



The mail route restriction was removed by Congress in February, 1919, and since that time it has been possible to select for improvement roads that would tend toward the development of the several States and accommodate the greater number of people. With this restriction removed there was still a tendency among many of the States to parcel out the Federal Aid to the various counties and communities, which resulted in the improvement of many short stretches of disconnected highway. From a purely local standpoint these roads were important, but such a plan would never result in a real State Highway System. It was seen that there should be a well planned system in each State, connecting with a similar system in each adjacent State.

The Act of February 28, 1919, brought the total amount of Federal funds appropriated to \$275,000,000, and it was seen that in order to assure a complete system of highways for the States and the Nation some definite action must be taken.

Two principal plans were given careful consideration. One plan provided that the Government should lay out and construct entirely with Federal funds a system of National Highways of a high type. The other plan provided that State systems should be constructed by the States with the assistance of Federal Aid as had been done heretofore, but it also provided that the States should each submit a proposed system not to exceed seven per cent of its total highway mileage of the State. This system to be composed of primary or interstate highways which would not include more than three-sevenths of the system, the remainder of the system to be composed of secondary or inter-county highways.

The latter plan was passed by Congress and became law when the President signed the bill, November 9, 1921. Among other provisions this law requires that State funds shall be made available for expenditure under the direct control of the State Highway Department.

The Secretary of War is authorized and directed to transfer to the Secretary of Agriculture, upon request, all surplus war material and supplies which are suitable for highway improvement.

It requires that preference be given to such projects as will expedite the completion of an adequate system of interstate highways. It requires that upon this system all Federal Aid apportionments shall be expended. Types, width, character of construction and maintenance are subject to the approval of the Bureau of Public Roads.

Should any State fail to provide proper maintenance on a Federal Aid Project, the Bureau is required, after having given proper notice, to proceed with the maintenance of the project and to deduct the cost of such maintenance from the apportionment of the Federal Aid to that State, and it is not permitted to approve any further Federal Aid projects in the State until the

State has reimbursed the Federal Government in the amount of the cost of such maintenance, the amount so reimbursed to be reapportioned among all the States.

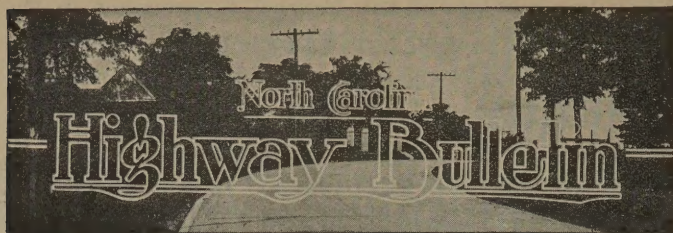
At the present time the total amount appropriated or authorized by Congress is \$540,000,000 to aid the States in their road construction. In addition to this \$47,000,000 has been appropriated for the construction of roads and trails in the national forests.

As has already been indicated, the responsibility for the proper expenditure of this vast fund has been placed in the hands of the Secretary of Agriculture, who in turn looks to the Bureau of Public Roads to carry out the provisions of the act and the rules and regulations which he has promulgated. It is, therefore, seen that the Bureau of Public Roads is made responsible to see that this amount is expended in accordance with the law. Both the law and the rules and regulations have been amended whenever it appeared that a change was necessary. The law of July, 1916, and subsequent amendments have added very much to the responsibility and importance of the Bureau of Public Roads. But it has also added very much to the opportunities and responsibilities of the State Highway Departments. In many cases it has been the immediate cause of their being called into being. It is impossible to exaggerate the importance of each State having a well organized and capable State Highway Department. Wherever State and Federal laws are in conflict they should be made to harmonize. It is of course more practicable for the States to bring their laws into harmony with the Federal laws than for Congress to meet the provisions of the 48 States.

It should be borne in mind that the law requires the Bureau to co-operate with the State through its State Highway Department, not through its county boards or congressmen. It places the power of initiative with the State Highway Department and agrees with the State Highway Department to pay a certain amount of Federal Aid when certain conditions have been met and certain work has been done in accordance with the State's specifications and plans which have been previously approved by the Bureau. Whenever a State fails to take up the Federal fund to which it is entitled, that amount is forfeited and is redistributed among all the States.

The State selects its own highway system, prepares its map, and submits it to the Bureau for the approval of the Secretary of Agriculture. The Bureau compares it with similar maps submitted by adjoining States and in conference with the State departments the necessary adjustments at State lines are made. These adjustments are usually very simple and easily made and agreed to. This system having been submitted and approved the State selects projects on the system and





PUBLISHED MONTHLY BY  
NORTH CAROLINA STATE HIGHWAY COMMISSION  
RALEIGH, NORTH CAROLINA

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This BULLETIN will be sent gratis to any State or county official, contractor, newspaper, trade publication, library, or other person interested in the improvement of roads and in the work of the Commission. Advertising rates may be obtained on application.

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## Editorial

Prosperity in North Carolina received another boost when the General Assembly now in session passed the bill appropriating \$15,000,000 additional for highway work. Good roads and prosperity go hand in hand.

The manner in which a Resident Engineer on a job interprets the specifications determines to a large degree the success of the work and either makes or breaks the contractor. Assistant State Highway Engineer C. N. Conner will have an article on this subject in the March Bulletin and every engineer should give it his careful attention.

The 1923 Construction Program was put under way February 1st when bids were opened on over two hundred miles of roadwork. Plans for 1923 call for the awarding of approximately 800 miles of work.

District Engineers should read the item on page — entitled "District Notes" and make it a point to send in proper material.

Principal Locating Engineer O. B. Bestor will have an article in the next issue on grade crossing elimination, a subject of vital importance to all who use the highways. Mr. Bestor has had considerable experience along this line and is making a special study of the problem in North Carolina.

There are some no doubt who are not familiar with the history and operation of the Bureau of Public Roads in Washington which handles the Federal Aid work in connection with the different State Highway Departments. A history of this organization will be found on page 4.

The tables showing status of work in the State have been revised and somewhat changed in makeup this month. The Editor will appreciate having his attention called to any errors.



# Contracts Awarded February 1st

**S**PIRITED bidding was in evidence at the letting held on February 1st, one hundred and sixty-five bids being received on the twenty projects advertised to be let. Bids were rejected for the roadway on one project, temporarily held on the grading of two projects and on the structures on one. A slight increase was noted in unit prices of some items but as a whole they were very satisfactory. Bids were awarded on approximately 121 miles of graded, topsoil and gravel road and on 80 miles of hard-surfaced roads, concrete surfacing being in the majority. The results of the letting are as follows:

The grading work on Project No. 107, consisting of 19.3 miles of road in Bertie County between Windsor and Aulander, was temporarily held in abeyance, while the structures on the same Project were awarded to the Atlantic Bridge Company, of Roanoke, Va., on their bid of \$50,127.90.

Nello L. Teer, of Durham, was successful bidder for the grading and topsoil surfacing on Project No. 147, located in Hertford and Bertie counties between Winton and Aulander, a distance of 16.8 miles. Bridgework on the same project was awarded to the Atlantic Bridge Company. The contractor's bid on the former was \$73,573.50 and on the latter, \$37,559.10.

Project No. 155-B, perhaps the choice job of the letting was bid in by W. T. Hadlow, of Jacksonville, Fla., at a price of \$493,900.40. This work consists of paving with plain concrete, 19.3 miles of route 30, between Williamston and Bethel, Martin County.

The Public Service Production Co., of Newark, N. J., were successful bidders on Project No. 163, Nash County, their bid being \$409,592.40. This work consists of paving with plain concrete 14.96 miles of route No. 90 from the Franklin—Nash County line, via Spring Hope, to Nashville.

Bids on the roadway of Project No. 291-B, Wilson County, were rejected, while the structures on the same Project were awarded to Jno. M. Ogden & Sons, of Pollocksville, N. C., for \$11,809.30.

Both roadwork and structures on Project No. 273, Sampson County, were awarded to the Eagle Engineering Co., of New Bern at a total cost of \$88,106.20. This Project extends from Clinton to the forks of the Elizabethtown road on route No. 40, a distance of 2.44 miles. Plain concrete pavement will be laid.

No bids were received on the roadwork on Project No. 275, which extends from the end of Project No. 273 to Delway, a distance of 10 miles. Structures on the same Project were awarded to Rhyne & Kitchen, of New Bern, N. C., for \$8,063.40.

The Newell Contracting Company, of Clinton, were successful bidders for the grading on Project No. 363, Onslow County. This contract covers the grading and topsoil surfacing on 15.22 miles of road between the Jones County line and Jacksonville, which will cost approximately \$109,826.50. The structures on this pro-

ject were awarded to the Pittsburg-Des Moines Steel Co., of Richmond, Va., for \$79,698.00.

Project No. 391-A, Robeson County, 1.03 miles of paving in the town of Red Springs was temporarily held up.

H. M. Beasley, of Lumberton, was awarded both grading and structures on Project No. 391-B, 1.10 miles of topsoil road from the Hoke County line to Red Springs, his bid being \$17,433.00 for the entire job.

Project No. 403, Chatham County, 7.01 miles of gravel road from the Wake County line to the Lee County line, on route No. 50, was awarded to the C. G. Kershaw Contracting Co., of Birmingham, Ala., for \$40,567.00.

R. B. Sandidge, of Georgetown, Del., a new-comer to North Carolina, was successful in bidding for Project No. 429, Granville County, 6.94 miles on route No. 75, from the Virginia State line to Stovall. Plain concrete pavement will be laid at an approximate cost of \$239,021.90, this figure including structures.

O. A. Mann & Co., of LaGrange, Ga., was awarded the contract for roadway and structures on Project No. 486, Wake County, 9.04 miles of topsoil road from Bonal to Apex, their bid being \$36,932.00.

Project No. 512, Caswell County, 11.67 miles of topsoil road from Yanceyville to the Rockingham County line, was awarded to J. T. Plott, of Greensboro, for \$49,432.30.

The Mayfield Construction Co., of Lakeview, was awarded, on a bid of \$82,646.00, the contract for the road work on Project No. 555, Randolph-Montgomery counties, 20.55 miles of topsoil road from Seagrove to the Moore County line. Structures on this project were not let.

Project No. 671, Rowan County, was awarded to Thompson-Caldwell Construction Co., of Charlotte, for \$246,440.90 and the structures to the Atlantic Bridge Company, of Roanoke, Va., for \$34,706.50. This work consists of paving with asphaltic concrete 7.34 miles of road on route No. 10 between Salisbury and Barber.

The Atlantic Bitulithic Company, of Washington, was awarded the contract for Project No. 743, 11.1 miles of asphaltic concrete between Winston-Salem and the Stokes County line, at a cost of \$376,441.30.

Project No. 752, Stokes County, consisting of 9.67 miles of topsoil road between Vade Mecum and Mount Airy, was awarded to W. E. Graham, of Mount Ulla, for \$113,522.50, inclusive of structures.

Geer & Wilson, of Rutherfordton, were awarded 11.63 miles of topsoil road located in Burke, Cleveland and Lincoln counties, between Morganton and the Cleveland-Lincoln County line, and known as Project No. 815. The bid for the grading and surfacing was \$89,446.00, while that for the structures, which were let to J. L. Von Glahn, of Spartanburg, S. C., was \$39,456.70.

The Gibson Construction Company, of Knoxville, Tenn., was awarded the grading and structures on Project No. 991, Transylvania County, 7.31 miles between Lake Toxaway and Sapphire, for a bid of \$206,912.00.



# Bridge Construction Notes

By C. B. TAYLOR, *Construction Engineer*

ONE by one the old bridges over the streams throughout North Carolina are being replaced by modern structures of concrete reinforced with a network of steel and designed to safely bear the loads of years to come. Notable among these bridges is that over Haw River at Bynum, Chatham County, on route No. 75 between Pittsboro and Chapel Hill. For the past forty or fifty years traffic across the stream at this point was served by the old covered wooden bridge pictured above. It is an interesting fact that this old bridge when built some forty-five years ago was bid in by the successful contractor, according to records in the Chatham County courthouse at Pittsboro, for the sum of \$4,444.44. The structure was built of oak and put together with large pins of the same material and when torn down to make way for the new structure some of the members were found to be in perfect condition. As a whole, however, the structure was in such shape as to be unsafe for the constantly increasing traffic to which it was subjected.

The new bridge, Project No. 400, is approximately 800 feet long in over-all dimensions, consisting of nineteen 40-foot reinforced concrete deck girder spans and will cost, in round figures, \$57,420.00. R. M. Walker and Co., of Atlanta, Ga., are contractors for the work and expect to finish the Project within a short time.

Those who are in doubt as to whether or not the bridge at Morrisville, Wake County, on Project No. 436,

will be completed should take heart as it is expected to be opened to traffic within the next month or six weeks.

Construction work is under way on Project No. 673, Rowan-Davidson counties and within a short time will be in full swing. This bridge which is over the Yadkin between Salisbury and Lexington, on route No. 10, will replace the tall bridge which has been in use at this point for a number of years. The new structure, which will be of reinforced concrete will be located between the present bridge and that of the Southern Railway.

Survey parties are at work on the location of Project No. 610, Anson County. This bridge will be located near the plant of the Blewetts' Falls Power Company up the river from the present ferry between Wadesboro and Rockingham on route No. 20. When completed it will be one of the largest bridges in the State and the third large bridge over the Pee Dee River, the other two being the one over the Yadkin at Salisbury and the Swift Island bridge near Albemarle.

Construction is nearing completion on Project No. 606, Anson County. This bridge is over Rocky River, between Norwood and Wadesboro, and when completed will replace an old toll bridge. The new bridge, consisting of ten 50-foot spans of reinforced concrete, is being built by the Concrete Steel Bridge Company of Clarksburg, W. Va., and will cost approximately \$54,759.00.

EDITOR'S NOTE.—The Editor would be glad to receive material similar to the above regarding work in other sections of the State.

## U. S. Bureau of Public Roads—History and Purpose

(Continued from page 5)

submits project statements to the Bureau. A representative of the Bureau in company with a representative of the State Highway Department makes a preliminary inspection to determine whether or not the project is one that is entitled to receive Federal Aid. Upon being satisfied that it is so entitled the District Engineer recommends its approval by the Secretary of Agriculture, and when his approval has been given, funds are set up for the Government's portion of the cost. The State then proceeds to make surveys, plans and estimates, which are in turn submitted to the District Engineer. If after making a field inspection with the plans in hand he finds them to be satisfactory they are recommended by him and by the Chief Engineer for approval by the Secretary, and the State is authorized to begin construction even though the agreement has not been executed. The agreement, however, must be executed before any payments of Federal funds may be made.

The law requires that adequate means must be used to assure the work being done economically. This pro-

vision is usually met by advertising the work and letting it to the lowest responsible bidder. Where this is not done complications frequently arise which delay the payment of Federal funds.

During the progress of construction on each project an engineer from the Bureau makes frequent inspections, usually in company with a State engineer. These inspections are generally made every month, but they are in no sense intended to relieve the States from constant inspection where necessary, as in bridge or other concrete construction. Whenever unsatisfactory conditions are found an attempt is made on the ground to correct such conditions. A report is made to the district office, a copy being forwarded to the State Highway Department.

It will thus be seen that both in the field and office the Bureau attempts to keep the State Department informed of any criticism or suggestions that it finds to be necessary and to have corrections made as promptly as possible.



Payments of Federal Aid are usually made from time to time on each project as work progresses, and upon completion of a project a final inspection is made, and if the work is found to be satisfactory the final voucher is paid.

No two of the forty-eight State Highway Departments have exactly the same form of organization, nor

do they have just the same problems, but the same Federal law applies to them all. This and the fact that State and Federal laws are not always in harmony sometimes produce difficult situations which require some diplomacy and patience on the part of both the State and the Government representatives.

## Designed Subgrade

By C. M. UPHAM, *State Highway Engineer*

**THESE** facts in connection with subgrade design may be conclusively stated:

1. The bearing power of nearly all soils is increased when the moisture content is decreased.
2. The bearing power is affected more by moisture in some soils than in others.

Therefore, the first two principles in the design of subgrades are the regulation or exclusion of water and the selection of a subgrade soil or material that has the highest bearing power and is least affected by moisture.

In selecting soil for subgrades, it is desirable to select a material that will have a high bearing value, even though it has become saturated with water. Generally speaking, the coarser the material up to a certain practical size for working, the less the capillary saturation and the greater the bearing power. Experiments have shown that a layer of coarse material such as sand or gravel, when placed over clay, retards the capillary water from rising to the top of the subgrade, or in the case of soil roads, to the top of the surface; from which it may be seen that the value of the design of the subgrade not only depends on the regulation of moisture but on the selection of the subgrade material as well.

Any system of drainage that will prevent water from finding its way to the subgrade will suffice or serve as a means of freeing the subgrade of the water that does by chance find its way there. Generally the solution is found in the selection of subgrade material and a combi-

nation of ditches and underdrains. Care should be taken that the ditches are only of a sufficient depth to lower the water table and are located far enough from the traveled way to interpose no hazard to traffic.

If side or longitudinal ditches are designed properly it seldom happens that longitudinal pipe underdrains are necessary, for the open side ditch will perform all the drainage functions of such drains.

Assuming that surface water may be cared for by ditches and that water in the subgrade from springs and other sources may be relieved by underdrains and ditches, the problem of caring for capillary water still remains. The most satisfactory way to cut off capillary water is to introduce a layer of material of low capillary value, or, in other words, a material through which the passage of the capillary water will be retarded. This often can be accomplished by selecting in the grading of the road, material of low capillarity and using it for a subgrade on which will rest the hard-surface, or in the case of soil roads, for that portion used by traffic. It often happens that it is more economical to borrow material, the bearing value of which is least affected by water, for the subgrade, and it sometimes may be desirable to waste materials from cuts, and borrow satisfactory material for the fills. Too much stress has been laid on the balancing of quantities and too little stress has been laid on the selecting of material entering the subgrade.

## District Notes

**B**EGINNING with the March issue a section of the Bulletin will be devoted to "District Notes." Several suggestions have been made to the Editor regarding a department of this nature and it is hoped that the field men will co-operate to the extent of making the venture a success. As planned, a section under the above heading will be devoted to each district and will contain news items pertaining to that particular district. These items should be brief and should be of interest

to the engineers throughout the State. Any short cut that has worked successfully on construction or maintenance or any feature of the work that is unusual would be interesting and doubtless helpful to men having similar problems in the other districts. The success of this department depends entirely on the men in the field and a district will show up well or badly according to the material sent in. The department will not be carried on unless sufficient interest is shown to warrant same.



# Convention of American Road-Builders

**T**HE work, or science if it may be called such, of building the Nation's highways took a step forward as a result of the Road Show and Congress which was held in Chicago during the week of January 15-19, 1923. Here highway problems were presented and discussed by men prominent in this line of endeavor; contractors, engineers, and equipment manufacturers met and learned more about the latest equipment and methods for road building, thereby more closely uniting these agencies and making for better work. Approximately 500 delegates participated in the Convention exclusive of the thousands who were in attendance at the Road Show.

Six sessions of the Convention were necessary for the presentation of the thirty technical papers. These sessions were held in the Congress Hotel and each one devoted to a different phase of highway work; the first session being devoted to general policies, the second to design and research, then followed construction, maintenance, traffic and finance. A great deal of interest was shown in all of these subjects and it was the opinion of those in attendance that the information gained from these talks, many of which were illustrated, would be of value in securing the construction of better and more economical roads and the more efficient functioning of the various State highway departments.

North Carolina played an important part both in the Convention and at the Road Show. Because of the extensive highway program that is being carried out in this State it has gained a reputation that is nationwide and for this reason more than passing interest was shown in the papers read by engineers from the State Highway Commission and in the exhibit which was put on at the Road Show.

Mr. Chas. M. Upham, State Highway Engineer, read two papers, one on "Designed Subgrade," and the other, "Progressive Construction in North Carolina;" abstracts from both of these will be found elsewhere in this issue of the **Bulletin**. Mr. Page, Chairman of the State Highway Commission was to have read a paper on maintenance work and organization in North Carolina but for unavoidable reasons could not be present and was represented by W. E. Hawkins, State Maintenance Engineer, who delivered a splendid address, illustrated by appropriate slides, on the manner in which an intensive maintenance program was placed under way in North Carolina. Much favorable comment was heard on all sides and requests were made for copies of the paper.

The exhibit which was put on at the Road Show in the Coliseum, and in charge of the Editor of the **Bulletin**, consisted of transparent photographs of road and bridge construction throughout the State, a large map showing the location and, in a general way, the type of work to be let during 1923, road and bridge plans, and other information in regard to highway work.

Numerous questions were answered and from the interest evidenced by contractors it is believed that the exhibit will prove well worth while.

The success of the Convention was due largely to the efforts of Mr. Upham and the members of the entertainment committee, of which he was chairman. Further honor was given to North Carolina in the nomination and practical election of State Highway Commissioner Frank Page as president of the American Road Builders Association. The election of officers takes place in New York at the business meeting in May and Mr. Page's election is practically assured.

## Messrs. Kistler *and* Hanes Appointed on Highway Commission


**T**O fill the vacancy caused by the resignation of Mr. John C. McBee, Commissioner from the Eighth District, Governor Morrison has appointed Mr. A. M. Kistler, of Morganton, the appointment taking effect February 1st. In the resignation of Mr. McBee the Commission lost one of its most able members and at the same time it is fortunate in the selection by Governor Morrison of Mr. Kistler. The new Commissioner from the Eighth District has been very successful in his connection with a large tannery at Morganton and is actively connected with a number of other manufacturing enterprises in this and nearby towns. In addition to his business connections Mr. Kistler is a leader in any civic movement for the betterment of his home town.

The Seventh District lost a valuable representative on the Highway Commission when Governor Morrison appointed Hon. R. A. Doughton as State Commissioner of Revenue, succeeding A. D. Watts. "Governor" Doughton is, in years of service, one of the oldest members of the House of Representatives and since its organization in 1921 has been one of the leading members of the Highway Commission. Governor Morrison again showed good judgment in the selection of a man to fill Mr. Doughton's place on the Commission when he appointed Mr. Alexander S. Hanes, of Winston-Salem. Mr. Hanes is president of the Hanes Rubber Co., and is actively connected with a number of other business enterprises in his home city.



# Hints to Resident Engineers

GEO. F. SYME, *Senior Highway Engineer, N. C. State Highway Commission*

T seems to the speaker, that if a man aspires to be a successful engineer he should be possessed of two out-standing qualifications, viz., (1) he should appreciate the value of his employer's money which he spends, i. e., he should know how to spend it to obtain maximum returns, and (2), he should possess a high degree of technical knowledge. In rating these two types of knowledge, I would place No. 1 at 75 per cent, and No. 2 at 25 per cent. These two requirements are inseparable at 25 per cent. These two requirements are inseparable, that is, they merge together,—for obviously the engineer could not know how to spend the money to the best advantage without technical knowledge,—but technical knowledge is useless, and even ruinous, to him without a thorough and constant appreciation of the value of money. No. 1 might be subdivided into the following components:

(a) He should know and appreciate the fact that money is invested in engineering work for the sole purpose of earning dividends or interest, whether that work be private or public.

(b) He should have a well defined knowledge of what a given piece of construction should cost and what the various materials which should enter into it are worth.

(c) He should be able to so direct the work that it will not exceed its proper cost. He must be an organizer.

(d) He should be able to give, in a clear indisputable manner, a detailed report on the final cost of the work. This should be so clear, and so backed up by simple figures, sketches and dimensions, that a contractor, or some other engineer, can easily check each computation and field measurement, and pronounce them correct and complete. This might be called the bug-a-boo of the incompetent engineer—or the FINAL ESTIMATE.

The man who cannot prepare an intelligent final estimate should not be allowed to hold a responsible engineering position any more than a child should be allowed to play with a loaded revolver—for both are indicative of great disaster. The child may wreck its own existence, but the engineer may wreck not only himself, but his employer as well.

No. 2 might also be divided into a number of components, some of which (with reference to highway or railway engineering), are

(a) A thorough knowledge of Location. This consists, first, of a proper appreciation of the negative value of grades, distance, curvature, and rise and fall, because the road, or railroad, is built for the purpose of transport, and second, the engineer must know how to so place his line on the ground that the cost of construction is a minimum. When these two phases of locating are properly taken care of the ideal economic (not necessarily cheap) location for the road is found, and a maximum return in the shape of dividends or interest accrues to the public, or to the investors in the rail-

road. A poorly constructed surface may be repaired but a poorly located road simply represents misplaced capital for which there is no redemption. In the speaker's opinion proper location is by all odds the most important part of highway or railway engineering. Summed up it may be said that the best location is that which not only costs the least to construct, but which gives the least operating cost per ton-mile, or per car-mile, or per train-mile, as the case may be.

(b) The engineer must be thoroughly familiar with construction materials, their strength, physical and chemical properties, and with the best methods of using them.

(c) He must be thoroughly versed in mathematics up to and including plane trigonometry, and he must understand well various kinds of surveying.

(d) He should have at least a working knowledge of applied mechanics and of general designing.

The above are some of the more important qualifications that an engineer must have to succeed. Have you these qualifications? If not, you may obtain them by thoughtful study. Begin now.

One rarely sees the efficiency in executing public work that obtains on work done with private capital, for the reason that the latter demands a substantial, visible return from the investment, is exceedingly cautious of the expenditure of each dollar, and makes a loud noise accompanied by vigorous action when the expenditure seems excessive. The engineer is thus forced to look to his defenses, i. e., he must justify his expenditures.

On the other hand when the public foots the bill, as in our highway work, this incentive is lacking, because no particular person is expecting a direct monetary return and the tendency is to grow careless. This is a natural sequence and it seems to explain why highway engineers, with some exceptions, are not the equals of their brothers who work for private concerns, in matters of location and final estimates.

Let us remember this in conclusion: That while it may be true that no particular person is expecting a direct monetary return from our highways, he is nevertheless entitled to it. Our highways must be made to yield the highest possible returns on the investment and it is every whit our duty to see that this is done in behalf of the public who employ us, as we would most certainly do under the club of a private corporation.


Let us therefore try to visualize our particular jobs from a larger, broader viewpoint, and if we can succeed in doing this we will find it easy climbing to the highest rungs of the ladder of success—but if we bury our heads in the fine sands of hair-splitting technical details to the exclusion of the larger problems before us, we will never get beyond the realm of pen-pushing or of peeping through an instrument.

\* Extracts from an address to a class of Resident Engineers at Raleigh, February 13.



# Progressive Construction

By C. M. UPHAM, *State Highway Engineer*

 THE North Carolina method of progressive construction is to grade the road, using the same standards for line and grade that are used in hard-surface construction. Only one standard of drainage structures is used regardless of whether the road is merely graded or is to be covered with a hard-surface. This construction of graded road will care for the light traffic which generally exists in all newly developed localities. This graded road is at all times maintained and when the increased traffic creates a high cost of maintenance, then it is indicated that it is time to construct the next higher type of road surface. The next step in the progressive type of road is to cover the graded road with a selected soil material, such as sand-clay, topsoil or gravel. This material is generally of higher bearing value than the natural soil, and is a material which is less affected by moisture and therefore more suitable for use as a road surface. This selected surface material is maintained as a subgrade highway until such time as the maintenance cost becomes excessive and the increased traffic indicates that a hard-surface roadway is necessary.

The cost of grading and the drainage structures generally constitutes about one-sixth of the ultimate cost of a hard-surface road. To add a selected soil surface adds very little difference to the cost of this construction; consequently about six times as much road, with a selected soil surface, may be constructed for the same money as though the money was spent for the immediate construction of hard-surface roads. This makes it possible for transportation to be benefited to a much greater extent and the State to develop at six points rather than at one.

It will be noted that the construction of the selected soil surface is an addition to the graded road, and no previous step in the grading or construction of drainage structures has been lost or thrown away in the construction of this selected soil surface road.

In the progressive type road all steps taken in its construction include the utilization of all previous construction when transforming the road to the next higher type, and each step may be considered as a subgrade for the next higher type surface. This in itself justifies the expenditure of a sufficient amount of money to select soils of a character which may, with proper maintenance, be used as a surface material until such a time as traffic demands, or the cost of maintenance makes it necessary to construct the next higher type of hard-surface. By this method of construction the graded road or the selected soil surface can truly be called a subgrade highway, and is often the economic solution for road construction over a large portion of a State system.

The ultimate step in progressive type construction is the addition of the hard-surface. After the maintenance on the selected soil surface becomes excessive or when the country and traffic develop to the extent that a hard-surface road is necessary, the next step is to construct the hard-surface pavement directly on the selected soil surface. This method of progressive construction utilizes advantageously the selected soil surface as a stabilized subgrade for the hard-surface pavement, and on account of the complete settlement, and on account of the character of the selected soil surface, the subgrade is stabilized sufficiently to aid the hard-surface in carrying the loads.

Therefore it may be seen that with the construction of the progressive type road, light traffic or a small tonnage is cared for by a graded road of comparatively low cost. As the traffic demands and tonnage increases, the road is increased in strength, and the increase of the investment is justified. As the traffic and tonnage increase to the maximum, a hard-surface road is constructed. The construction of roads on progressive principles means that the greatest percentage of the invested money is in permanent construction, and justifies the expenditure of bond money in any progressive type road.

North Carolina has constructed many progressive type roads. It has already completed its cycle by placing hard-surfaces on roads which were previously graded and stabilized with a selected soil material, although at present it has a reasonable mileage of graded roads in the newly developed localities; it is maintaining as subgrade highways a large mileage of selected soil roads and thus affording a means of traffic to a great portion of the State. The completion of about 400 miles of hard-surface construction in 1922, many miles of which were hard-surface added to progressive type roads, demonstrates the complete and satisfactory manner in which the progressive type road is caring for the traffic in North Carolina. It shows that this method of road construction is no longer in the experimental stage but is economically and practically sound.

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"No single improvement has done more for the general good of the country than the development of our highway system."—President Harding.

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The lesson gained from past road building experience is that immediate maintenance lessens the final cost of a road or bridge.



## STATUS OF FEDERAL AID WORK IN NORTH CAROLINA

*Projects Under Construction*

'H S' denotes any type of hard surfaced road.

'G' denotes any type of gravel, sand-clay, or topsoil road.

NO	COUNTY	LENGTH	TYPE	APPROXIMATE COST	BEGUN	CONTRACTOR
15	Guilford.....	4.205	Bit Mac	\$ 5,441.75	9-1-17	County Commissioners.
61	New Hanover.....	2.186	P. C.	234,841.39	7-12-20	C. W. Lacy
69	Transylvania.....	9.348	W. B. Mac.	231,409.04	3-25-20	Allport & Alexander Construction Co.
94A	Mitchell.....	5.04	W. B. Mac.	190,375.13	6-22-20	Gibson Construction Co.
125A	Alleghany.....	4.99	T. S.	153,899.13	11-22-21	W. E. Graham

*Projects Completed*

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	COMPLETED	CONTRACTOR
1*	Mecklenburg.....	.....	Bridge	\$ 59,224.90	9-5-18	C. W. Requarth & Co.
2*	Henderson.....	7.75	Gravel	33,141.74	12-17-19	State Convict Labor
3*	McDowell.....	2.85	T. S.	24,405.73	12-17-19	County Commissioners
4*	Craven.....	9.46	T. S.	21,089.23	10-12-19	County Commissioners
5*	Burke.....	8.03	T. S.	19,888.05	11-1-19	County Commissioners
8*	Cumberland.....	13.46	T. S.	62,800.71	6-20-21	County Commissioners.
9*	Polk.....	12.78	T. S.	68,175.45	4-15-21	County Commissioners.
11*	Lenoir.....	1.78	S. A.	56,893.18	1-25-21	West Construction Co.
12*	Wayne.....	8.62	T. S.	26,727.98	11-2-20	County Commissioners.
13*	Wayne.....	12.573	T. S.	101,467.23	12-1-21	County Commissioners.
14*	Halifax.....	8.01	T. S.	19,017.83	8-20-20	State Convict Labor.
16	Haywood.....	14.27	Gravel	64,705.05	9-22-22	County Commissioners.
17	Wilkes.....	17.6	T. S.	101,386.08	7-9-22	County Commissioners.
18*	Alexander.....	9.8	T. S.	66,446.49	3-31-21	County Commissioners.
19*	Rockingham.....	8.21	T. S.	32,759.36	11-11-19	County Commissioners.
20*	Yadkin.....	6.41	T. S.	25,146.45	7-26-20	County Commissioners.
21*	Person.....	7.675	T. S.	25,911.04	3-15-20	County Commissioners.
22A*	Alamance.....	1.196	P. C.	30,103.48	6-27-19	County Commissioners.
22B*	Alamance.....	8.3	P. C.	290,179.36	8-19-21	Powell Paving and Construction Co.
23*	Burke.....	7.68	T. S.	42,873.90	11-1-20	Lovelady Township Forces.
24*	Wake.....	4.24	P. C.	127,840.21	11-30-19	W. W. Boxley & Co.
25*	Person.....	8.175	T. S.	101,537.51	10-20-20	County Commissioners.
26*	Davidson.....	8.41	T. S.	14,115.96	10-1-19	County Commissioners.
27A*	Orange.....	8.235	T. S.	53,945.73	4-23-21	W. S. & L. A. Crawford.
29*	Union.....	8.655	T. S.	58,949.25	4-8-21	County Commissioner—J. S. Stearns.
30*	Mecklenburg.....	6.304	Bit Mac	102,551.35	3-31-21	County Commissioners.
31*	Buncombe.....	3.1	P. C.	70,147.88	10-24-19	County Commissioners.
33	Montgomery.....	3.72	T. S.	15,246.71	7-8-21	County Commissioners.
34	Wayne.....	.....	Bridge	50,798.00	10-8-21	Roanoke Bridge and Iron Works, Inc.
35*	Forsyth.....	1.87	P. C.	59,867.61	2-25-20	County Commissioners.
36*	Durham.....	3.46	P. C.	115,075.57	12-15-19	R. G. Lassiter & Co.
37*	Gaston.....	10.30	Bit Mac	167,173.23	12-28-21	County Commissioners.
38*	Rockingham.....	10.92	T. S.	46,809.92	9-17-20	County Commissioners.
38A	Caswell.....	6.67	T. S.	50,907.23	7-6-21	Bolton Construction Co.
39*	Union.....	10.61	T. S.	74,337.71	4-9-21	County Commissioners—J. S. Stearns.
40*	Union.....	4.287	T. S.	18,434.20	12-11-20	County Commissioners.
41*	Watauga.....	8.95	Gravel	94,681.29	11-10-21	County Commissioners.
42*	Stanly.....	11.67	T. S.	80,922.15	9-10-20	Gibson Construction Co.
43*	Beaufort.....	2.2	P. & R. C.	95,089.12	5-11-20	Simmons Construction Co.
44*	Granville.....	4.57	T. S.	51,377.43	4-20-21	T. W. Chandler—P. R. Ashby.
45*	Buncombe.....	7.852	A. C.	359,777.28	7-23-21	H. A. Wells—Asheville Construction Co.—Asheville Paving Co.
47*	Guilford.....	4.607	A. C.	162,689.83	4-8-21	County Commissioners.
48A*	Northampton.....	5.804	S. C.	60,620.51	10-30-20	Virginia Contracting Co.
48B*	Northampton.....	2.69	S. C.	44,749.65	10-4-20	Porter & Peck—A. C. House.
49*	Lenoir.....	6.017	S. A.	199,872.19	6-1-21	T. H. Gill & Co.—West Construction Co.
50*	Guilford.....	2.65	A. C.	101,596.44	12-31-20	County Commissioners.
51*	Guilford.....	2.26	A. C.	87,603.12	9-27-20	County Commissioners
52*	Cabarrus.....	8.986	T. S.	162,399.61	3-22-21	Gibson Construction Co.—J. E. Lane.
53*	Lenoir.....	7.234	S. A.	246,838.20	2-10-21	T. H. Gill & Co.—West Construction Co.
54*	Wake.....	6.811	A. C.	239,736.26	8-23-20	R. G. Lassiter & Co.
55A*	Mecklenburg.....	6.008	Bit Mac	196,899.73	12-28-20	Simmons Construction Co., Inc.
55B*	Mecklenburg.....	4.59	Bit Mac	188,445.18	8-13-21	Simmons Construction Co., Inc.
56*	Forsyth.....	5.868	T. S.	47,709.31	10-29-20	C. B. Hester—Luten Bridge Co.
57*	Rowan.....	6.75	T. S.	72,549.27	4-22-21	W. E. Graham—R. M. Hudson Co.
58*	Johnston.....	6.018	T. S.	69,453.50	5-20-20	P. R. Ashby.
59*	Columbus.....	11.025	T. S.	106,872.26	1-26-22	County Commissioners.
60*	Lenoir.....	7.88	S. A.	259,445.25	3-31-22	T. H. Gill & Co.—West Construction Co.
62*	Buncombe.....	3.43	Bit Mac	139,191.32	1-27-22	H. C. McCrary, Inc.—Asheville Construction Co.
63*	Buncombe.....	3.76	A. C.	167,933.55	9-29-21	Allport & Alexander Construction Co.—H. C. McCrary, Inc.—Asheville Paving Co.
65*	Pitt.....	9.57	Graded	99,191.06	10-20-21	Porter & Peck.
66*	Haywood.....	6.18	Gravel	105,296.45	4-4-22	O'Biern Construction Co.
67*	Nash.....	8.81	A. C.	384,126.08	4-20-21	R. G. Lassiter & Co.
68*	Sampson-Harnett..	27.4	S. C.	305,225.54	6-24-22	P. R. Ashby—F. L. Grant, Inc.



# STATUS OF FEDERAL AID WORK IN NORTH CAROLINA---Continued.

## Projects Completed (Continued.)

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	COMPLETED	CONTRACTOR
70A	Jackson.....	4.83	T. S.	\$ 150,081.11	8-18-20	Wright & Nave.
71*	Durham.....	6.69	R. A.	319,153.39	10-26-21	State Forces.
72*	Anson.....	3.896	T. S.	70,470.89	3-4-21	Gibson Construction Co.—J. A. Kreis & Co.
73*	Nash.....	8.73	T. S.	159,913.16	4-10-22	Porter & Boyd.
74A*	Stanly.....	2.803	T. S.	25,537.45	8-20-20	County Commissioners.
74B*	Stanly.....	4.92	T. S.	63,411.26	5- -21	County Commissioners.
75	Columbus.....	7.06	S. C.	66,605.38	.....	County Commissioners.
76*	Cabarrus.....	1.35	A. C.	54,583.76	10-29-20	R. M. Hudson & Co.
77*	Rutherford.....	2.206	P. C.	100,159.44	9-5-21	E. T. Belote.
78A*	Rutherford.....	9.64	T. S.	88,230.71	8-3-21	Ross Brothers.
78B*	Rutherford.....	10.26	T. S.	71,056.48	8-3-21	Ralph E. Oliver.
79*	Cleveland.....	1.645	A. C.	67,063.64	10-30-20	Noll Construction Co.
80A*	Montgomery.....	16.6	T. S.	226,516.20	6-20-21	County Commissioners.
80B*	Montgomery.....	11.07	T. S.	65,145.02	10-25-21	Lee J. Smith Const. Co.—P. R. Ashby.
81	Pender.....	26.11	T. S.	273,439.45	12- -21	Porter & Boyd.
82*	Davidson.....	4.54	T. S.	59,983.71	12-18-20	Heilig & Sherrill.
84A*	Burke-McDowell..	8.33	T. S.	128,193.76	8-3-21	J. A. Kreis & Co.
84B*	McDowell.....	6.76	T. S.	109,659.49	8-1-21	J. A. Kreis & Co.
85*	Davie.....	8.28	T. S.	58,756.89	9-26-20	W. E. Graham.
86A	Martin-Bertie.....	3.09	T. S.	98,454.67	2-25-20	State Forces.
86B	Martin-Bertie.....	.....	Bridges	332,308.83	3-19-21	Boyle-Robertson Construction Co.
90*	Pamlico.....	12.03	Graded	127,981.78	9-16-21	Eagle Engineering Co.
91*	Surry.....	10.68	T. S.	113,805.84	6-27-21	W. E. Graham—R. W. Curtis & Co.
92*	Surry.....	10.38	T. S.	133,141.03	6-20-21	W. E. Graham—R. W. Curtis & Co.
93	Franklin-Warren..	19.8	T. S.	192,993.57	9-25-20	Chandler & Ragland—Stearns Bros.
96*	Yancey.....	2.95	Gravel	82,653.12	1-10-22	Gibson Construction Co.
96B	Yancey.....	.....	Bridges	12,345.19	2-22-22	Booz, Lloyd & Co.
98A	Moore.....	20.53	T. S.	259,240.35	5-31-22	J. T. Plott—J. E. Lane & Co.
98B*	Moore.....	8.75	T. S.	41,055.46	3-8-22	Lee J. Smith Construction Co.
98C*	Lee.....	4.53	T. S.	18,240.64	10-29-21	Gibson Construction Co.
99A*	Chatham.....	12.65	T. S.	126,717.70	8-11-21	T. W. Chandler and State Forces.
99B	Chatham.....	21.82	T. S.	259,931.59	11-19-20	J. T. Plott—Atlantic Bridge Co.
100*	Avery.....	14.00	W. B. Mac.	272,089.78	3-20-22	Southern Dray Co.
101A*	Randolph.....	10.14	T. S.	123,893.99	8-12-21	S. L. Davis—J. A. Kreis & Co.
101B*	Randolph.....	9.64	T. S.	107,928.75	3-6-22	J. T. Plott—Hanford Bros.
103*	Duplin.....	11.32	T. S.	111,931.05	10-20-21	County Commissioners.
105*	Hoke.....	9.8	T. S.	95,501.80	10-25-21	Jameson Brothers—George, Hankins & George.
107*	Madison.....	2.46	Gravel	70,901.40	10-11-21	Southern Dray Co.
109*	Burke.....	3.58	T. S.	55,191.64	5-21-21	C. E. Teague.
111*	Forsyth.....	12.22	T. S.	94,447.10	8-17-21	C. B. Hester—Heilig & Sherrill.
112*	Caswell.....	11.93	T. S.	147,065.71	11-2-21	J. M. Gregory and J. E. Lane & Co.
114*	Rowan.....	2.543	A. C.	83,587.02	3-17-21	R. M. Hudson & Co.
116*	Stanly-Montgom'	.....	Bridge	199,614.80	1-9-22	Cornell-Young Co.
117*	Wilson.....	6.25	T. S.	41,828.93	3-21-22	County Commissioners—Lee J. Smith.
120	Bladen.....	23.67	S. C.	105,688.55	4-18-22	J. A. Morrow—P. A. Ashby.
121*	Stokes.....	11.60	T. S.	108,519.62	1-14-22	Jameson Bros.—Rogers & Shumway.
127	Wilson.....	7.63	T. S.	33,780.45	6-27-21	County Commissioners—Lee J. Smith.
129*	Richmond.....	17.28	S. C.	77,507.48	12-28-21	Mulligan & Roach.
136*	Davie.....	6.99	T. S.	61,733.04	12-4-21	Chandler & Ragland—Hagedorn Const. Co.

\*Final Settlement Made with Federal Government

# STATUS OF STATE WORK IN NORTH CAROLINA

## Projects Under Construction

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	BEGUN	CONTRACTOR
100	Beaufort.....	10.50	R. C.	\$ 369,777.70	8-23-21	W. T. Hadlow.
101	Beaufort.....	4.23	P. C.	142,836.33	1-20-23	Public Service Production Co.
105A	Beaufort.....	2.00	P. C.	71,680.00	11-11-22	J. I. McGhee Cont. Co.
105B	Beaufort.....	5.037	P. C.	164,301.64	1-19-23	Public Service Production Co.
106	Bertie.....	7.12	T. S.	58,204.90	9-11-22	J. F. Mulligan Const. Co.—Boney & Hostetler.
113	Chowan.....	10.32	Graded	40,975.73	4-27-22	Nello L. Teer—P. R. Ashby.
114	Chowan.....	10.00	Graded	45,064.09	1-4-22	Battershill & Goode—Chandler & Ragland.
125	Edgecombe.....	15.11	A. C.	428,438.76	2-28-22	R. G. Lassiter & Co.
131	Gates.....	13.50	T. S.	135,516.01	8-22-22	Bacon & Moore—W. D. Murray—Sadler Corp.
132	Gates.....	9.73	S. C.	63,921.00	8-29-22	J. A. Morrow.
133	Gates-Pasquotank.	14.07	P. C.	138,050.00	11-14-22	C. W. Lacy—Pittsburg Des Moines Steel Co.
137	Halifax.....	5.67	Bit Mac	124,736.97	10-31-21	O. F. Leighton—A. C. House.
138A	Halifax-North-	.....	.....	.....	.....	.....
	ampton.....	12.59	S. C.	131,712.13	5-1-22	Nello Teer—Richards Bros.
145	Hertford.....	12.88	Graded	86,379.70	7-31-22	Nello Teer—Atlantic Bridge Co.
151	Hyde.....	4.30	T. S.	71,422.78	12-10-21	C. W. Lacy—Porter & Peck.
152	Hyde.....	10.89	S. C.	75,651.40	1-15-23	O. A. Mann & Co.
154	Martin.....	11.27	A. C.	394,090.74	4-17-22	Sou. Willite Paving Co.—O. F. Leighton, Inc.
155	Martin-Pitt.....	20.00	T. S.	98,176.65	1-12-22	J. P. Dicus—P. R. Ashby.
157A	Martin.....	12.41	T. S.	90,763.86	10-18-22	Jamison & Bro.—J. A. Morrow.
157B	Martin.....	12.36	T. S.	90,396.24	11-13-22	J. F. Mulligan Constr. Co.—Batson Cook Co.
159	Nash.....	11.22	Gravel	89,942.43	1-22-22	J. A. Kreis & Co.
160	Franklin-Wake-	.....	.....	.....	.....	.....
	Nash.....	8.93	Gravel	53,722.95	1-27-21	Chandler & Ragland—Southern Dray Co.



## STATUS OF STATE WORK IN NORTH CAROLINA---Continued

## Projects Under Construction (Continued)

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	BEGUN	CONTRACTOR
166	Northampton.....	0.47	Graded	\$ 17,954.75	3-20-22	W. D. Murray—Sadler Corp.
167	Northampton.....	20.48	T. S.	87,294.90	7-17-22	Virginia Contr. Co.—Bacon & Moore.
173	Perquimans-Pasquotank.....	7.22	R. C.	239,444.70	8-29-22	Williams & Williams.
174	Pasquotank-Camden.....	2.4	Cord	55,818.01	4-3-22	D. E. Williams.
175	Pasquotank.....	9.50	Brick	217,405.72	4-6-21	County Commissioners.
183A	Pitt.....	13.54	P. C.	399,854.40	11-13-22	S. J. Groves & Sons.
183B	Pitt.....		Bridge	32,343.30	3-27-22	B. J. Boyles.
184	Pitt.....	7.14	P. C.	206,516.42	11-21-22	Public Service Production Co.
185	Pitt.....	14.35	Graded	31,069.72	3-28-22	J. A. Marrow.
191	Tyrell.....	6.91	S. C.	57,934.41	1-20-22	C. W. Lacy—M. M. Jones.
195	Washington.....	15.18	S. C.	65,619.35	2-27-22	L. M. Lee & Co.—B. J. Boyles.
196	Washington.....	14.93	S. C.	82,099.60	5-15-22	W. H. Thompson—Nello Teer.
200	Carteret.....	13.68	Graded	79,629.00	7-21-22	Eagle Eng. Co.—Batson-Cooke Co.
201	Carteret.....	15.2	Graded	24,956.30	1-17-23	Duplin Constr. Co.—Batson Cooke Co.
210	Craven.....	8.34	A. C.	287,919.35	4-3-22	West Construction Co.—A. P. Gilbert.
211	Craven.....	9.93	A. C.	262,673.20	1-30-22	Union Paving Co.
218	Wayne-Duplin.....	16.06	Graded	80,804.50	8-4-21	C. W. Lacy.
219	Duplin-Lenoir.....	15.60	Graded	148,339.20	6-1-21	Chitwood & Palmer.
236 <sup>(FA 143)</sup>	Johnson.....	14.83	A. C.	475,321.55	10-2-22	R. G. Lassiter & Co.
245	Jones.....	15.76	Bit Mac	244,737.90	3-22-22	Hyde & Baxter.
254	Lenoir.....		Bridge	66,740.00	11-22-22	Roanoke Iron & Bridge Co.
263	Pamlico.....	12.03	A. C.	289,324.02	3-27-22	Union Paving Co.
264	Craven-Pamlico.....	0.14	R. C.	27,156.25	7-24-22	Rhyne & Kitchen.
272	Sampson.....	16.47	Graded	98,807.39	6-19-22	R. E. Martin—Striblin—Staudy & Newell.
280	Wayne.....	10.01	A. C.	311,352.36	11-28-21	Union Paving Co.
281	Wayne.....		Bridge	22,484.88	10- -21	P. R. Ashby.
291	Wilson.....	7.63	A. C.	203,498.18	1-17-22	P. R. Ashby.
294	Wilson.....		Bridge	14,340.00	11-29-22	Stearns Bros.
300	Bladen.....	11.99	S. C.	65,189.90	4-8-22	T. W. Chandler—Nello Teer.
301	Bladen.....	13.17	T. S.	82,028.21	11-21-21	J. F. Mulligan—Powell Paving & Const. Co.
312	Brunswick.....	9.77	P. C.	247,319.68	7-5-22	Alabama Conc. Prod. Co.—Batson-Cooke Co.
313	Brunswick.....	3.44	A. C.	105,389.85	3-15-22	Sou. Willite Paving Co.—Roanoke Bridge & Iron Works.
314	Brunswick.....	15.82	S. C.	99,326.45	2-23-22	Hagedorn Const. Co.
316	Brunswick.....	12.12	S. C.	80,068.72	8-14-22	B. Frank Price—Batson, Cooke Co.
317	Brunswick.....		Bridge	18,893.82		Atlantic Bridge Co.
325	Columbus.....	11.22	T. S.	105,258.23	11-3-21	J. A. Kreis-Cornell-Young Co.
326	Columbus.....	13.61	S. C.	195,838.19	5-23-22	J. T. Plott—J. A. Kreis & Co.
327	Columbus.....	5.2	S. C.	38,269.44	6-21-22	J. A. Kreis.
328	Columbus.....	7.03	P. C.	219,371.68		L. L. Tindall
338	Cumberland-Sampson.....		Bridge	26,233.99	10-28-21	Roanoke Bridge & Iron Works.
339	Harnett-Cumb'lnd.....	7.54	T. S.	16,524.75	11-30-21	Porter & Boyd.
340	Cumberland.....	11.07	P. C.	381,032.02	6-15-22	Alabama Conc. Prod. Co.—Hobbs & Peabody.
342	Cumberland.....	5.91	A. C.	177,402.50		A. J. Wardrep.
351	New Hanover.....	10.64	A. C.	200,006.40	1-8-23	Southern Willite Paving Co.
364A	Onslow.....	9.95	S. C.	44,631.40	3-14-22	R. E. Martin.
364B	Onslow.....	12.84	T. S.	99,819.00	6-26-22	A. W. McClay.
375	Pender.....	15.56	S. C.	72,522.92	11-11-21	A. W. McClay.
376	Pender.....	7.64	Graded	94,757.85	11-11-21	C. G. Kershaw Const. Co.—Cornell Young Co.
377	Pender-Duplin.....	1.61	S. C.	76,985.70	3-22-22	R. E. Martin-Hazell-Coneratt-Quist Co.
378	Pender.....	14.12	W. B. Mac.	213,502.96	7-19-22	C. W. Lacy.
379	Pender.....	10.00	S. A.	100,000.00	5-22-22	State Forces.
386-87	(F A-140) Robeson.....	9.86	P. C.	647,888.05	9-14-22	James O. Heyworth.
389	Robeson-Colum.....	1.56	T. S.	83,463.38	10-26-21	L. A. Chitwood.
400	Chatham.....		Bridge	57,420.22	4-14-22	R. M. Walker & Co.
402	Chatham.....	6.92	T. S.	33,940.28	8-1-22	J. F. Mulligan Construction Co.
409	Durham.....	0.5	Gravel	6,140.64	1-13-22	J. P. Dicus.
411	Durham.....	5.81	R. C.	211,574.92	9-1-22	Hutton Eng. & Const. Co.
412	Durham.....	8.80	P. C.	252,582.33	11-15-22	L. L. Tindall.
419	Franklin.....	12.82	T. S.	63,021.97	7-27-22	Jamison Bros.—J. M. Gregory.
420	Franklin.....	1.56	R. C.	55,421.30	7-11-22	Chandler & Ragland.
427	Granville.....	5.12	A. C.	159,097.62	12-1-21	R. G. Lassiter & Co.
428	Granville.....	4.19	R. C.	132,637.77	7-14-22	Pittman Const. Co.
456	Orange.....	9.00	Graded	37,459.07	1-7-22	Crawford & Crawford—Nello Teer.
460	Orange.....	9.87	A. C.	296,835.55	9-25-22	R. M. Hudson & Co.
463	Person.....	11.24	P. C.	327,171.35	8-14-22	Porter & Boyd.
473 <sup>(FA 146)</sup>	Vance.....	7.83	P. C.	265,546.60	7-11-22	R. G. Lassiter & Co.
481	Wake.....	7.20	A. C.	252,925.15	1-24-22	Union Paving Co.—P. R. Ashby.
484	Wake.....	8.79	P. C.	311,629.40	8-23-22	P. R. Ashby-Booz-Lloyd & Co.
492	Warren.....	4.49	Bit Mac	100,436.13	4-10-22	Porter & Peck—A. C. House.
493	Warren.....	3.88	Bit Mac	77,866.80	7-27-22	Porter & Peck.
494 <sup>(FA 147)</sup>	Warren.....	6.21	A. C.	208,130.01	9-6-22	Clifford Engineering Co.
501	Alamance.....	13.10	T. S.	32,627.10	12-7-21	W. M. Shook—Hanford Bros.



# STATUS OF STATE WORK IN NORTH CAROLINA --- *Continued*

## *Projects Under Construction (Continued)*

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	BEGUN	CONTRACTOR
502	Alamance	17.43	T. S.	\$ 138,629.97	7-17-22	W. E. Graham—Hanford Bros.
503	Alamance		Bridge	59,450.38	7-17-22	Atlantic Bridge Co.
504	Alamance	5.22	A. C.	154,127.16	3-17-22	Elliott & Sholes.
525	Davidson	10.24	A. C.	363,141.68	12-23-21	Elliott & Sons & Boggs—Austin Bros. Bridge Co.
528	Davidson	10.24	P. C.	427,511.92	10-2-22	Hagedorn Constr. Co.—J. A. Peterson.
532	Guilford	11.70	A. C.	387,499.20	2-1-22	Elliott-Sholes Co.
533	Guilford-Forsyth	10.50	P. C.	427,997.62	7-11-21	Royer-Ferguson Const. Co.
535	Guilford	7.78	R. C.	259,357.01	9-21-22	Leaksville Lumber Co.
538	Guilford		Bridge	7,039.01	9-1-22	J. L. Brinkley.
544	Hoke	10.45	S. C.	32,445.49	5-16-22	O. A. Mann & Co.—J. T. Figg.
545	Hoke	10.45	T. S.	58,195.06	6-5-22	O. A. Mann & Co.—A. W. McClay.
546	Hoke	0.5	S. A.	27,948.80	11-27-22	Dawkins Constr. Co.
566	Moore	7.14	T. S.	61,380.66	3-6-22	Gibson Const. Co.—Nello Teer.
569	Moore	18.97	S. C.	97,141.45	8-1-22	Mayfield Const. Co.
577	Randolph	13.37	P. C.	411,375.77	4-18-22	Royer-Ferguson Co., Inc.—J. L. Brinkley.
588	Rockingham	7.98	R. C.	266,498.43	4-11-22	Cheatwood & Driscoll.
589	Rockingham	9.81	P. C.	324,975.31	10-30-22	Cheatwood & Driscoll—Atlantic Bridge Co.
593 <sup>FA 38</sup>	Rockingham-Caswell	17.60	P. C.	525,393.22	7-11-22	J. A. Kreis.
600	Alexander	9.3	T. S.	12,530.98	5-26-22	Bolton Construction Co.
601	Alexander	3.07	T. S.	33,630.45	4-3-22	Gus Ginn, Inc.—R. M. Thurmond.
602	Alexander	9.28	Bit Mac	189,329.80	10-9-22	W. E. Graham.
606	Stanley-Anson		Bridge	54,759.32	3-23-22	Concrete Steel Bridge Co.
607	Anson	6.39	T. S.	40,517.29	3-21-22	Geer & Wilson—Booz-Lloyd & Co.
608	Anson	7.88	A. C.	345,408.58	9-18-22	Lampton & Burks—J. A. Peterson.
614 <sup>FA 144</sup>	Cabarrus	9.20	P. C.	350,085.07	6-20-22	A. L. Harris—Oliver & Costello Bros.
622	Catawba	10.85	A. C.	354,684.88	1-23-22	Union Paving Co.
629	Catawba	8.40	P. C.	268,662.48	6-5-22	A. L. Harris—R. M. Thurmond & Co.
630A	Gaston	3.02	A. C.	98,392.36	10-21-21	W. F. McCanless.
630B	Gaston	6.65	A. C.	188,748.99	8-8-22	W. F. McCanless, Hobbs-Peabody Constr. Co.
632	Gaston	9.5	R. C.	291,868.94	1-2-22	Davis-Wilcox Const. Co.
639	Iredell	10.59	A. C.	387,448.42	1-2-22	R. M. Hudson Co.—Luten Bridge Co.
640	Iredell	8.17	Bit Mac	181,990.82	9-26-22	W. E. Graham.
647	Lincoln	7.10	P. C.	250,108.15	6-5-22	A. L. Harris —R. M. Thurmond & Co.
653	Mecklenburg	8.84	A. C.	308,182.44	1-16-22	Union Paving Co.—Luten Bridge Co.
654	Mecklenburg	10.1	A. C.	302,887.09	4-3-22	Lampton & Burks.
658	Mecklenburg	9.55	A. C.	270,704.92		Union Paving Co.
661	Richmond	9.76	T. S.	40,683.41	7-18-22	McDonald & Brooks.
665	Richmond	5.77	A. C.	194,501.23	7-28-22	A. J. Wardrep.
670	Cabarrus-Rowan	4.53	P. C.	142,221.53	6-29-22	Southern Construction Company.
673	Davidson-Rowan	0.59	Bridge	285,565.20	9-19-22	Hardaway Contracting Co.—Elliott & Sons.
677	Scotland-Robeson	7.11	R. & P. C.	283,460.21	4-26-22	P.R. Ashby—Chitwood & Palmer.
693	Union	1.0	Gravel	3,324.48		Sykes-Collins Co.
694	Union		Bridge	23,549.13	11-14-22	Hagedorn Construction Co.
695	Union	4.5	A. C.	123,865.28	1-23-22	Redman Const. Co.
700	Alleghany	7.90	W. B. Mac	132,297.33	6-23-21	W. E. Graham.
701	Alleghany-Wilkes	8.00	W. B. Mac	153,863.60	6-16-21	W. E. Graham.
702A	Alleghany	7.75	W. B. Mac	209,188.98	10-31-22	O'Brien Constr. Co.—Luten Bridge Co.
711	Ashe	9.5	Gravel	60,000.00	9-7-22	Little Contracting Co.
712	Ashe	11.06	Gravel	197,687.38	10-24-22	J. T. Plott.
724	Caldwell	4.66	T. S.	51,890.66	5-8-22	County Road Commrs—R. M. Thurmond & Co.
725	Caldwell	2.4	T. S.	10,000.00	12-29-21	County Commissioners.
731	Davie	5.46	P. C.	195,393.11	3-13-22	G. R. Martin-Heilig & Sherrill.
741	Forsyth	8.90	R. C.	315,025.81	7-27-22	Hardaway Construction Company.
742 <sup>FA 137</sup>	Forsyth	10.62	R. C.	385,127.60	6-20-22	Harris Construction Co.
744	Forsyth	2.0	T. S.	*	1-11-22	Forsyth County.
750	Stokes	14.86	Gravel	93,054.38	9-15-21	J. F. Mulligan Const. Co.—Lee J. Smith.
761	Surry	2.22	P. C.	77,334.01	11-22-22	Geo. F. Martin.
764	Surry	1.63	R. C.	50,588.20	8-30-22	Leaksville Lumber Co.
765	Surry	3.4	P. C.	112,685.76	10-24-22	Campbell Constr. Co.
770A	Watauga		Bit-Mac	30,000.00	8-12-22	State Forces.
771A	Watauga	0.5	W. B. Mac	40,000.00	9-7-22	State Forces.
771B	Watauga	3.5	Gravel	75,000.00	9-7-22	State Forces.
780	Wilkes	18.00	Recon	25,000.00	7-25-21	J. F. Mulligan.
781	Wilkes	14.50	Recon	30,000.00	7-25-21	J. F. Mulligan.
782	Wilkes	5.97	R. C.	184,614.65	3-29-22	Hyde & Baxter.
784	Wilkes	4.97	T. S.	85,966.21	8-30-22	J. F. Mulligan Constr. Co.—Foster Constr. Co.
790	Yadkin	10.12	P. C.	308,123.42	4-24-22	Pittman Construction Co.
800	Avery	5.84	Grav & R C	198,827.02	7-24-22	O'Brien Const. Co.—J. A. Kreis.
811	Burke	6.0	P. C.	189,412.41	1-13-22	Southern Dray Co.
814	Burke	8.69	T. S.	13,459.60	8-15-22	M. A. Kollock.
821	Cleveland	1.58	P. C.	60,192.33	10-31-22	David-Wilcox Constr. Co.
822 <sup>FA 150</sup>	Cleveland	10.47	A. C.	404,378.48	9-27-22	Elliott & Sons—J. A. Kreis.
833	Henderson	10.22	Gravel	38,412.44	1-3-22	S. L. Davis Const. Co.—Asheville Const. Co.
846	McDowell	10.06	Gravel	204,680.74	9-12-21	Asheville Const. Co.—W. T. Taylor Const. Co.
847	McDowell	3.84	Graded	98,443.90	10-19-22	C. W. Lacy—Oliver & Costello Bros.
848	McDowell		Bridge	18,597.04	12-21-22	R. M. Thurmond & Co.
855	Mitchell	4.97	P. C.	174,363.78	9-12-21	Fiske-Carter Construction Co.
856	Mitchell	4.0	Bit Mac	239,005.80	3-20-22	Porter & Boyd—L. J. Chandler & Co.
858	Mitchell		Bridge	42,367.49	10-2-22	R. M. Thurmond & Co.
860	Mitchell	5.58	W. B. Mac	152,908.42	4-21-22	J. F. Mulligan—W. H. Anderson Const. Co.

\*Built by county



# STATUS OF STATE WORK IN NORTH CAROLINA---Continued

## Projects Under Construction (Continued.)

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	BEGUN	CONTRACTOR
866	Polk.....	6.0	Bit.-Mac.	\$ 180,393.40	4-3-22	Dunn & Woodall.
876	Rutherford.....	4.8	P. C.	146,264.80	12-30-22	Fiske-Carter Construction Co.
880	Rutherford.....		Bridge	24,679.43	4-4-22	Austin Bros. Bridge Co.
882	Rutherford.....	15.80	T. S.	89,010.46	9-20-22	Fiske Carter Const. Co.—J. H. Starns.
888	Yancey.....	15.22	W. B. Mac	230,499.94	10-10-22	The Luck Co.
903	Buncombe.....	2.58	A. C.	100,399.47	4-10-22	Asheville Paving Co.—R. C. Stevens.
904	Buncombe.....	1.60	A. C.	81,079.35	3-13-22	Asheville Paving Co.—R. C. Stevens.
910	Cherokee.....	7.56	Gravel	76,743.59	5-24-21	Ross Bros.—W. T. Moore Conc. Prod. Co.
911	Cherokee.....	10.33	Gravel	84,475.38	10-25-21	H. A. Wells—Southern Dray Co.
913	Cherokee.....	10.33	W. B. Mac	95,554.80	8-8-22	Mills, Williams Construction Company.
920	Clay.....	4.8	Gravel	54,875.81	1-9-22	E. A. Wilson & Co.—W. T. Moore Conc. Prod. Co.
921	Clay.....	12.37	Gravel	123,929.52	10-24-21	Lee J. Smith Const. Co.—W. T. Moore Conc. Prod. Co.
930	Graham.....	12.90	Gravel	130,522.00	10-15-21	Lee J. Smith Const. Co.—C. M. Dicus.
940	Haywood.....	7.13	W. B. Mac	126,082.00	4-14-22	Alexander & Patton—H. A. Brown & Co.
950	Jackson.....	7.56	Gravel	145,313.30	6-13-21	Wright & Nave—O'Brien Const. Co.
951	Jackson.....	11.85	W. B. Mac	249,546.00	8-17-22	R. H. Wright & Sons—W. T. Moore Conc. Prod. Co.
952A	Jackson.....	10.22	Graded	164,126.60	8-17-22	Brooks-Calloway Company.
954	Jackson.....	1.68	P. C.	90,871.77	7-1-22	Mills, Williams Construction Company.
960	Macon.....	4.97	S. C.	69,100.57	6-6-21	J. T. Plott—J. E. Lane & Co.
961	Macon.....	4.77	T. S.	58,340.59	12-5-21	J. T. Plott—J. E. Lane & Co.
962	Macon.....	13.58	W. B. Mac	171,310.04	4-24-22	O'Brien Const. Co.—Griffin Const. Co.
963	Macon.....	8.68	Graded	124,354.01	11-10-22	Costello Bros.—Brooks-Calloway Co.
970	Madison-Yancey..	13.80	W. B. Mac	267,378.26	11-11-21	R. H. Wright & Sons—O'Brien Const. Co.
980	Macon-Swain.....	17.84	W. B. Mac	350,175.11	.....	Costello Bros.—Condon & Condon.
990	Transylvania.....	8.87	W. B. Mac	151,238.89	6-5-22	Sam L. Davis Const. Co.—R. C. Stevens.

\*Reconstruction only.

## Projects Completed

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	COMPLETED	CONTRACTOR
139	Halifax.....		Bridge	\$ 18,436.66	8-25-22	Chandler & Ragland—Porter & Peck.
140	Halifax.....		Bridge	10,542.60	5-5-22	Von Glahn & Talbott.
186	Pitt.....	9.75	R. C.	260,816.60	8-5-22	Cheatwood & Driscoll.
209	Craven.....	2.65	P. R. C.	108,609.34	2-15-22	Eagle Engineering Co.
227	Greene.....	6.81	A. C.	238,113.70	1-25-23	West Construction Co.—Union Paving Co.
255	Lenoir.....	0.82	A. C.	33,957.00	8-18-22	West Construction Co.
281	Wayne.....		Bridge	22,484.88	1-15-23	P. R. Ashby.
388	Robeson.....	3.35	R. C.	137,000.40	9-8-22	C. W. Lacy—Roanoke Bridge & Iron Co.
410	Durham.....	2.3	R. C.	83,921.97	2-13-22	C. D. Riggsbee.
436	Harnett.....	21.19	Gravel	144,318.14	6-28-21	C. G. Keeshaw Const. Co.—Hobbs & Kitchen.
445	Lee.....	5.91	T. S.	18,692.85	5-20-22	C. B. Hester.
446	Lee.....	5.90	A. C.	197,188.22	5-24-22	Atlantic Bitulithic Co.—O. A. Mann & Co.
453	Orange.....		Bridge	33,706.80	4-15-22	Geo. W. Kane.
454	Orange.....	4.29	P. C.	192,006.15	3-16-22	Elliott, Sholes & Teer.
455	Orange.....	4.19	T. S.	46,415.77	11-28-21	J. F. Mulligan Const. Co.—P. R. Ashby.
482	Wake.....	6.64	A. C.	191,669.21	12-8-21	R. M. Hudson Company.
483	Wake.....	0.54	R. C.	19,989.75	8-7-22	C. D. Riggsbee.
500	Alamance.....	5.22	Graded	32,732.20	1-17-22	W. W. Tuck & Son—A. M. Hazell, Connerate—Quist Construction Co.
505	Alamance.....	0.42	S. A.	15,346.40	6-23-22	Hedrick Construction Co.
511	Caswell.....	14.8	T. S.	74,192.58	12-12-21	White & Simpson—C. B. Hester.
524	Davidson.....	0.3	S. A.	10,835.00	1-20-22	Town of Lexington.
526	Davidson.....	2.90	P. C.	130,826.19	8-24-22	Hagedorn Constr. Co.—Heileg & Sherrill.
539	Guilford.....	0.164	S. A.	21,639.20	1-19-23	Robt. G. Lassiter & Co.
540	Guilford.....		Recon.	15,000.00	1-23-22	J. T. Plott.
567	Moore.....	2.96	T. S.	7,600.00	.....	C. E. Teague.
634	Gaston.....		Recon.	4,500.00	.....	State Forces.
638	Iredell.....	7.88	A. C.	244,509.30	1-20-23	Thompson-Caldwell Co.
655	Mecklenburg.....	1.57	P. C.	62,028.68	.....	Speed-Parker Co., Inc.—Luten Bridge Co.
656	Mecklenburg.....	10.4	Bit.-Mac.	200,000.00	.....	State Forces.
657	Mecklenburg.....	1.38	Recon.	20,000.00	.....	State Forces.
692	Union.....	2.28	A. C.	65,366.67	12-28-21	Redmon Construction Co.
710	Ashe.....	3.14	P. C.	142,687.93	8-17-22	Pittman Construction Co.
719	Caldwell.....		Bridge	5,343.25	6-26-22	Cottrell & Howard.
722	Caldwell.....	7.00	Recon	12,000.00	1-18-22	County Forces.
751	Stokes.....	7.25	T. S.	31,746.00	10-4-21	W. E. Graham.
760	Surry-Alleghany..	6.9	T. S.	24,387.66	11-5-22	W. E. Graham.
801	Avery.....	9.93	W. B. Mac	22,350.24	10-26-22	Geer & Wilson.
823	Cleveland.....	2.0	A. C.	81,234.01	9-6-22	Southern Paving Co.—Z. B. Weathers & Son.
844	McDowell.....	1.80	P. C.	57,048.42	12-28-21	Bolton Construction Co.
845	McDowell.....	7.19	Gravel	132,177.93	11-22-22	J. W. Stapp Constr. Co.—Praytor, Howton & Wood.
855B	Mitchell.....		Bridge	7,454.15	8-22-22	Luten Bridge Co.
866	Polk.....	6.00	Bit Mac	180,393.40	11-21-22	Southern Paving Co.—Henry Constr. Co.



# STATUS OF STATE WORK IN NORTH CAROLINA---Continued

## Projects Completed (Continued)

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	COMPLETED	CONTRACTOR
877	Rutherford.....	9.79	T. S.	\$ 65,563.73	8-7-22	Geer & Wilson.
878	Rutherford.....	6.55	T. S.	50,913.50	10-27-22	Michaux Const. Co.—Geer & Wilson.
879	Rutherford.....		Bridge	5,737.38	12-30-22	Austin Bros. Bridge Co.
942	Haywood.....	0.57	Gravel	5,294.46	2-1-22	O'Brien Construction Co.

## PROJECTS UNDER CONTRACT

NO.	COUNTY	LENGTH	TYPE	APPROXIMATE COST	CONTRACTOR
138-B	Northampton-Halifax.....		Bridge	\$ 347,188.74	Pensacola Shipbuilding Co.
380	Pender.....	8.98	W. B. Mac	162,212.60	C. W. Lacy.
546	Hoke.....	8.0	A. C.	25,408.00	Dawkins Constr. Co.
589	Rockingham.....	9.81	P. C.	324,975.31	Cheatwood & Driscoll.
590	Rockingham.....	2.10	P. C.	66,092.18	Geo. R. Martin.
615	Cabarrus.....	3.88	A. C.	98,741.17	Thompson-Caldwell Co.
665	Richmond.....	5.77	A. C.	194,501.23	A. J. Wardrep.
691	Union.....		Bridge	14,837.02	J. S. Brinkley.
785	Wilkes.....	2.52	P. C.	78,703.50	D. J. Brookshire & Co.
953	Jackson.....	12.72	Graded	118,186.75	C. C. McCabe.

## Summary

### WORK UNDER CONTRACT

Type	STATE		FEDERAL AID	
	Miles	Cost	Miles	Cost
P. C.....	14.43	\$ 469,770.99		
W. B. Mac.....	8.98	162,212.60		
A. C.....	17.65	318,660.40		
Graded.....	12.72	118,186.75		
Bridges.....		362,025.76		
Total.....	53.78	\$ 1,430,856.50		

### WORK UNDER CONSTRUCTION

P. C.....	262.27	\$ 8,670,068.76	2.19	\$ 234,841.39
R. C.....	81.80	2,789,093.28		
A. C.....	261.32	8,470,729.81		
S. A.....	.50	27,948.80		
Bit. Mac.....	27.25	1,368,497.62	4.21	5,441.75
W. B. Mac.....	142.47	2,543,546.33	14.39	421,784.17
Brick.....	9.50	217,405.72		
T. S.....	269.38	1,887,738.60	4.99	153,899.13
S. C.....	190.48	1,348,458.12		
Gravel.....	146.05	1,730,095.96		
Graded.....	162.97	1,130,495.92		
Recon.....	32.50	55,000.00		
Bridges.....		731,978.33		
Total.....	1,616.49	\$ 30,971,057.25	25.78	\$ 815,967.44

### WORK COMPLETED

P. C.....	16.35	\$ 765,206.71	26.57	\$ 888,462.67
R. C.....	15.94	241,728.62		
A. C.....	32.33	1,052,038.11	42.28	1,708,696.99
S. A.....			22.91	760,048.82
Bit. Mac.....	16.40	380,393.40	30.64	794,260.80
W. B. Mac.....	9.93	22,350.24	14.00	272,089.78
T. S.....	58.35	319,512.09	597.86	5,439,460.42
S. C.....			83.91	660,397.11
Gravel.....	28.95	281,790.53	42.56	451,379.05
Graded.....	.88	47,820.60	21.60	227,172.84
Recon.....	8.38	51,500.00		
Bridges.....		103,705.72		654,311.72
Total.....	187.51	\$ 3,266,046.02	882.33	\$ 11,856,280.20

### LEGEND

P. C.—\*Plain Concrete. R. C.—\*Reinforced Concrete. A. C.—\*Asphaltic Concrete. S. A.—\*Sheet Asphalt. Bit. Mac.—\*Bituminous Macadam. W. B. Mac.—\*Water Bound Macadam. T. S.—†Top Soil. S. C.—†Sand Clay. Gravel—†Gravel. Graded—†Graded. Recon.—†Reconstruction. Cord.—†Corduroy..

\* Hard Surface. † "G" Type.

Corrected to February 1, 1923



## General Assembly Votes \$15,000.00 Additional Funds for Road Construction

(Continued from page 3)

location and therefore should have additional funds. A like amendment was offered from the western part of the State, this providing for a fund of \$3,000,000 to be set aside for needy districts, or those in which the counties are not able to participate to any extent in road building. The third and last of the defeated amendments was a proposal to allot the funds on a basis of area, population, mileage and income to the Commission from a particular county instead of the present method based upon area, population and mileage.

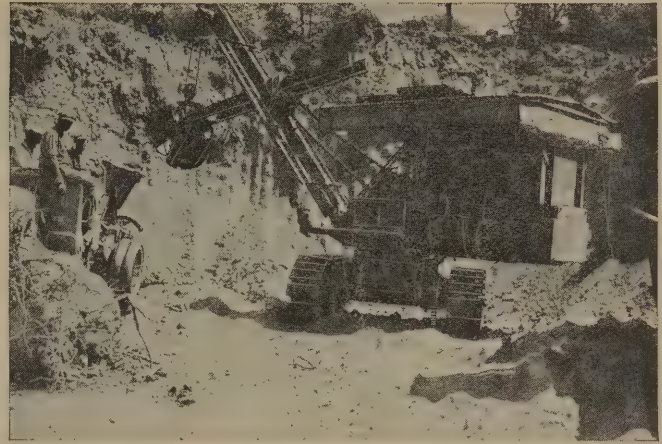
It will be interesting perhaps to review the work of the Commission during the past twenty-one months, or from April, 1921, when the act appropriating \$50,000,000 became effective. On the above date there was under contract or construction 107.3 miles of hard-surface roads valued at \$3,510,542.40, while on January 1st, 1923, there were 850 miles of similar work costing \$25,342,067, or an increase of 742.73 miles of road costing \$21,831,515. Of gravel, topsoil and sand-clay roads there was under contract or construction 586.58 miles, costing \$6,138,540.78, on April 1, 1921, while the first of January, 1923, found 930.7 miles, costing \$7,929,153.63, in the same status. A decrease in the average cost per mile of this type road from \$10,465 per mile to \$8,520 per mile, will be noted. Bridgework under contract or construction amounted to \$686,960 on April 1, 1921, and \$1,221,837, on January 1, 1923, an increase of almost 100%.

A large amount of work was completed during the period mentioned above. Hard-surface work completed during this time amounted to 137.58 miles representing an investment in prosperity of approximately \$4,345,113. Gravel, topsoil and similar types completed during the same period totalled 646.4 miles costing \$6,149,816; while bridgework completed amounted to \$669,187. The figures showing completed work do not include the percentage of completed work on projects that as a whole are not completed. Plans have been made to let during 1923 approximately 800 miles of road, about evenly divided between hard-surfaced and gravel or other similar types.

North Carolina is at the present time enjoying an era of prosperity which is due in a large measure to the wonderful highway system that is being developed. The next few years are bound to bring about even more marked improvement in every way and the people of the State will realize that the money spent in highways is well invested.



## GASOLINE SHOVEL



On its Corduroy Traction P & H Shovels have impressed the well-known Corduroy Trail in the soils of all parts of the world.

### 200 Trucks Loaded Per Day on Miami-Superior Highway

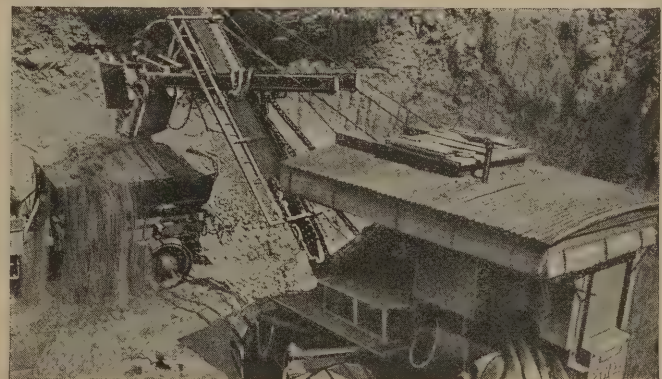
☐ This P & H Gasoline Shovel loads an average of 200 trucks (3-yard) per day. It is operated entirely by one man, can be maneuvered at will in its Corduroy Traction, has a crowding motion that forces the dipper to bite into the hardest soils.

☐ Being gasoline-engine driven, it is started quickly by the twist of the motor crank—there is no time or fuel lost. Aside from its power and dependability the P & H Shovel saves you money because of its economy of operation. The increasing number of contractors using P & H Shovels and Excavators testifies to their value.

Excavating Machinery Division  
PAWLING & HARNISCHFEGER CO.  
Established in 1884

3853 National Ave., Milwaukee, Wis.

SALES AGENTS:  
TRACTOR & MACHINERY SALES COMPANY  
1631 W. Broad St., Richmond, Va.



P & H Shovels may be converted into derrick or material handling cranes by replacing the Shovel Boom with the standard Crane Boom. Skimmer Scoop, or pile-driving rig, can also be used with the same machine.



# Tar-mac

## MAKES GOOD ROADS

*A scientifically prepared coal tar for the construction  
and maintenance of roads and streets.*

*Your Inquiries are Solicited*

### AMERICAN TAR PRODUCTS COMPANY

PLANTS:

Chicago, Ill.  
St. Louis, Mo.  
Youngstown, O.  
Steubenville, O.

GENERAL OFFICES:

208 SOUTH LA SALLE STREET  
CHICAGO

PLANTS:

Milwaukee, Wis.  
Birmingham, Ala.  
Rockton, Ill.  
Chalmette, La.

## "Standard" Paving Asphalt

has been successfully used on some of the most important highway projects in North Carolina.

This asphalt is refined from the straight Mexican asphaltic base petroleum, its purity being over 99.8%. "STANDARD" PAVING ASPHALT meets all the tests of a paving cement for asphalt concrete or sheet asphalt pavement, its uniformity and ability to resist extremes of temperature making it especially suited for these types of construction.

"STANDARD" PAVING ASPHALT has been used in practically every large city in the east.

### STANDARD OIL COMPANY (NEW JERSEY)

Baltimore, Md.

Charlotte, N. C.

Newark, N. J.

Richmond, Va.

REFINERIES: Bayonne, N. J., Baltimore, Md., Charleston, S. C.



## SLAUGHTER CULVERT COMPANY

300 - 301 MASONIC TEMPLE

RALEIGH



*Metal Culvert*

*Concrete Culvert*

## Washed and Screened Sand Gravel Crushed Stone

Conforming to the specifications of the North Carolina  
State Highway Commission.

*Prompt shipments by rail or water*

*Favorable freight rates to all North Carolina points.*

*Quotations gladly furnished on request.*

## THE ARUNDEL CORPORATION

MAIN OFFICE:

Pier 2 Pratt St.  
Baltimore, Maryland

BRANCH OFFICE:

519 Board of Trade Bldg.  
Norfolk, Virginia



# NORTH CAROLINA

## *Freckles!*

☪ The lad who is known by the mass of freckles which cover his face is always sure to be overflowing with vitality and life and activity.

☪ We would draw an analogy.

☪ During 1923 the highway trade papers of national circulation will carry as a feature of TEXACO advertising what is called "The Texaco Map." It is the purpose of this Map to convey to the road building fraternity some idea of the wide choice of Texaco Asphalt Pavements by cities, counties and States throughout the country. The States which have laid TEXACO on their highway systems are indicated on this Map by shading; each city is represented by a dot.

☪ Looking at the State of North Carolina on the Texaco Map one is reminded of the lad with the freckles. As the befreckled face indicates vitality and energy, the be-dotted surface of the State of North Carolina indicates another kind of energy which results in industry, progress and wealth.

☪ The great yardage of Texaco Asphalt Pavements on North Carolina's streets and highways is an apt indicator of the true position of this State commercially and industrially.

# TEXACO

New York  
Philadelphia  
Richmond  
Boston  
Jacksonville  
Atlanta  
New Orleans  
Memphis



The Texas Company  
ASPHALT SALES DEPT.  
17 Battery Place, New York City



Chicago  
Cleveland  
Oklahoma City  
Kansas City  
Houston  
Dallas  
Minneapolis



GEO. E. HOPPE, PRES.

GRAHAM B. BRIGHT, V.-P. &amp; SALES MGR.

# TRACTOR & MACHINERY SALES CO.

## DISTRIBUTORS

### RICHMOND, VIRGINIA

*We Offer You the Following Lines:*

## HOLT "CATERPILLAR" TRACTORS

### LAKEWOOD ENGINEERING CO.

LAKEWOOD MIXERS  
 LAKEWOOD-MILWAUKEE MIXERS  
 LAKEWOOD-UNIVERSAL MIXERS  
 MORTAR MIXERS  
 CONCRETE PLACING PLANTS, TOWERS,  
 HOPPERS, BUCKETS, CHUTES, BIN  
 GATES, ETC.  
 CONCRETE CARS AND BUGGIES  
 STEEL ROAD FORMS

LAKEWOOD-MILWAUKEE PAVERS  
 GROUT MIXERS  
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 PORTABLE TRACK AND TURNTABLES  
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INDUSTRIAL CARS AND TRACK

### AUSTIN WESTERN ROAD MACHINERY CO.

MOTOR ROLLERS  
 STEAM ROLLERS  
 JAW CRUSHERS  
 SCREENING PLANTS  
 TRACTOR GRADERS  
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ROAD DRAGS  
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### The GEO. HAISS MANUFACTURING CO.

WAGON LOADERS

CONVEYORS

### BAKER MANUFACTURING CO.

BAKER - MANEY WHEELERS

WE ALSO OFFER A FULL LINE OF SLOW SPEED TRAILERS FOR ALL PURPOSES; IN FACT, ANYTHING IT TAKES TO BUILD OR MAINTAIN A STREET OR ROAD.



**I**N twenty years Portland cement has advanced from comparative insignificance to the leading position in the construction material field. The ready adaptability of Portland cement to every kind of construction, from fence posts on the farm to gigantic dams and highways of endurance; the facility with which it can be handled; its durability which gives the highest degree of permanence, backed up by constant attention to perfection in manufacture and the most intelligent and comprehensive educative and advertising work that has ever been given to any building material, all combine to account for the remarkable progress achieved by the Portland cement industry. We take just pride in having always kept faith with the sound principles followed by this great industry.

Every requirement for the manufacture of the high standard of quality laid down by the established scientific standard specifications is rigidly followed in making Clinchfield Portland cement. Service in the fullest meaning of the word is our watchword in dealing with our customers.

Builded upon this firm foundation of quality and service the Clinchfield plant has steadily grown and expanded and its products have been used with constant satisfaction for all classes of construction work in the South.

**CLINCHFIELD PORTLAND CEMENT CORPORATION**  
Office and Mills: Kingsport, Tennessee



# CRUSHED STONE

*for*

CONCRETE PAVEMENT

*for*

TOPEKA OR WARRENITE SURFACING

*for*

CONCRETE BRIDGES

*for*

CONSTRUCTION WORK *of any* KIND

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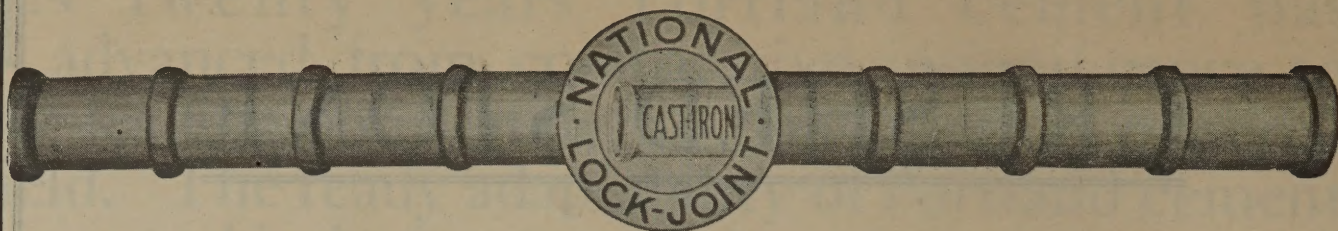
*For Delivered Prices in Any Quantity*

*Wire, Write or Phone*

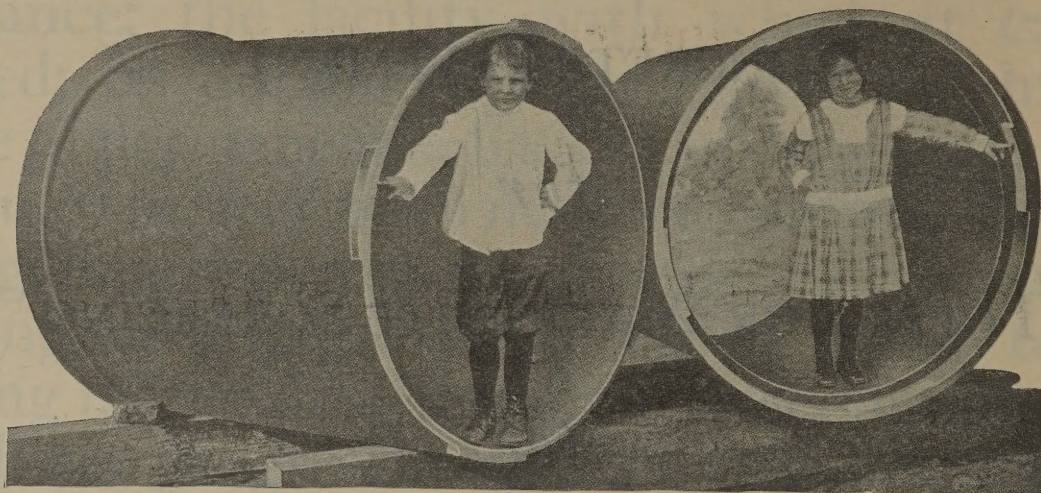
## ORINOCO SUPPLY CO.

WINSTON-SALEM, N. C.





Long Years *of* Life Ahead *of* Them



## *National Lock-Joint Cast-Iron Pipe*

The Pipe *of* Short Units, Long Service *and* Low Costs

*The Pipe that locks effectively, that prevents Separation  
and assures alignment to perfection.*

The pipe which solves culvert renewal problems with least expense, greatest efficiency. The pipe that does not rot or disintegrate, the pipe that is mechanically correct and has proved itself the solution of the culvert problem.

### CONTRACTORS *and* ENGINEERS, GET THIS:

TWO MEN, without the use of any tools whatsoever, will unload, handle and install all sizes up to and including 36 inches in diameter.

It is as cheap to handle and install as clay pipe WITH NO BREAKAGE LOSS. In shallow trench work the entire culvert can be built up, interlocked and rolled into place in one operation.

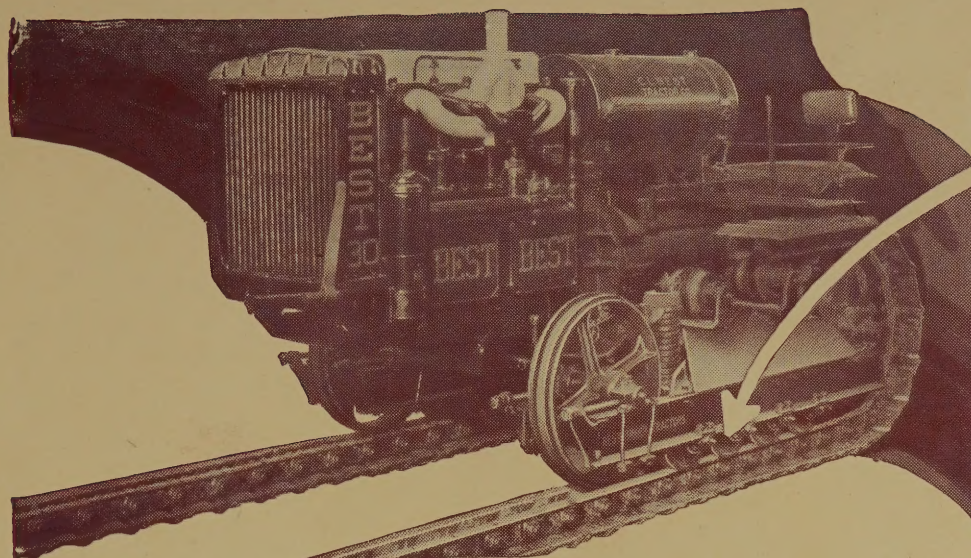


AMERICAN  
CASTING CO.

Birmingham, - - Alabama







## TRUCK ROLLERS *that* LAST!

THE DRIVING WHEELS of the most powerful locomotives have forged steel rims.

The Truck Rollers of a track type tractor support the weight of the tractor and the flanges of rollers must withstand severe jars and side strains of side hill work and rough going.

On Best Tractors the flanged rims of truck rollers are drop forgings—nothing less—forged into shape under heavy steam hammers, from heated steel of special analysis. After being forged the rims are annealed, bored and reamed, then turned true on the outside tread. They are next shrunk on accurately machined hubs—be-

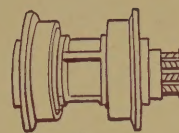
ing hardened at the same time—hardened to resist battering blows just as are the heads of first-class forged hammers or sledges.

The rollers, complete, are mounted on anti-friction bearings to insure easy running, bearings with seals to retain lubricant and to prevent entrance of sand and ruinous grit.

The truck rollers of Best Tractors run over tracks which are true and straight. Tracks are made from drop forged hardened links which have been accurately machined top and bottom and large hardened spools and pins at each joint contribute to the long life which may be expected from the tracks on Best Tractors.

E. F. CRAVEN, STATE DISTRIBUTOR

*"The Road Machinery Man"*  
GREENSBORO, N. C.



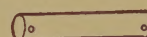
Truck Roller



Track Link Assembly



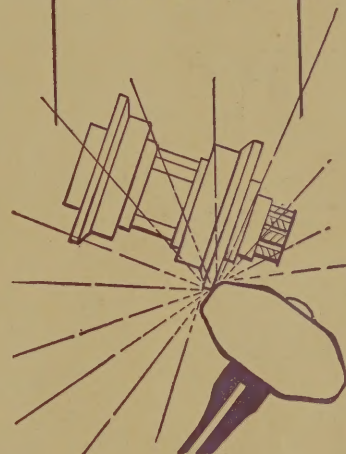
Track Spool



Track Pin



Heavy Cotter for Track Pin



"When Greek meets Greek." Both the sledge and the flanged roller rims are hardened drop forged steel.

# BEST TRACTORS

1222-4





ONE OF THE NORTH CAROLINA STATE HIGHWAY DEPARTMENT'S NO. 12 ROAD KING CUTTING DOWN A ROUGH DITCH BANK

## *in* North Carolina



**A**DAMS Graders have proved their superiority and their ability to build the most miles of Good Roads per dollar or per day. There's only one reason—the Adjustable Leaning wheels are an exclusive feature on Adams Graders by means of which the weight of Adams Graders is leaned toward and balanced against the load. This overcomes side-draft and skidding, increases capacity and lessens the draft. This feature also enables Adams Graders to do difficult ditch and bank work, not successfully accomplished with other graders.

Every Adams Grader is guaranteed to prove these claims. Write today for catalog and let us show you how Adams Graders will reduce your grading costs.

ADAMS GRADERS are built in 6½ ft. to 12 ft. blade lengths. There is a size to suit your needs and power exactly.

*Write Our Local Distributor*

**J. C. BENJAMIN**

733 WEST HARGETT STREET

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**J. D. ADAMS & COMPANY**

HOME OFFICE AND FACTORY:

INDIANAPOLIS, INDIANA

# ADAMS ADJUSTABLE LEANING WHEEL GRADERS